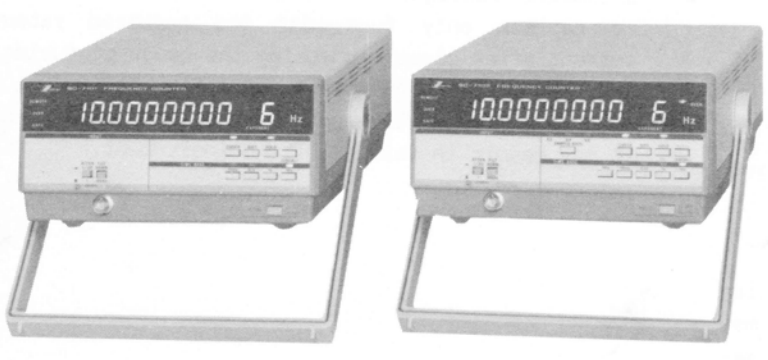
INSTRUCTION MANUAL

FREQUENCY COUNTER

SC-7101/SC-7102

IWATSU



INSTRUCTION MANUAL

FREQUENCY COUNTER

SC-7101/SC-7102

F697-816151(L)
F271-816151(L)

Cautions on Operations

When using the Frequency Counter SC-7101/SC-7102, take care on the following items.

Ambient Temperature and Ventilation

The instrument operate normally in the ambient temperature of 0°C to +40°C. Be sure to use the instrument within this range. Use beyond the limits of this range can result in some trouble. Do not place anything near the ventilating hole in the cover to improve the efficiency of heat dissipation.

Check the Supply Voltage

Before plugging the power cord to an electrical output, be sure to check its voltage. The instrument can be used on the line voltage shown in Table 1, which can be selected with the voltage selector plug on the rear panel. Operating the instrument on other than the specified voltages can result in breakdown.

In case of switching the voltage selector, remove the power cord. Then remove the fuse holder cap by turning it in the direction shown by an arrow. Pull and remove the voltage selector, then insert into the desired center voltage value.

Table 1

Center voltage	Voltage range
AC 100 V	90 to 110 V
AC 120 V	108 to 132 V
AC 220 V	198 to 242 V
AC 240 V	216 to 264 V

Do Not Apply Excessive Voltage

The maximum allowable input voltage is 200 V (DC + peak AC). Never apply any voltage beyond these voltages.

Connection of Input Signals

Use a supplied coaxial cable for connection of input signals. Use of single core wires may cause an incorrect measurement by electric noises due to induction. When there is any fear of mixing of noises, etc., check input signals with the oscilloscope. Start measuring only after confirming that there is no mixing of noise, etc.

Switch on the Rear Panel

The 10 MHz STD OUT-IN switch on the rear panel is set to OUT side at the time of shipment. When this switch is set to "IN" side, no signal of the internal reference oscillator is connected. Be sure to set this switch in "OUT", since setting in "IN" will not allow measurement without applying external reference signal.

Earth a Protective Ground Terminal

When supplying the line voltage from the power consent using a two-conductor type power cord, ensure to connect the ground terminal on the rear panel to the earth in order to prevent a danger.

When supplying the line voltage from the power consent using a supplied three-conductor type power cord, grounding is provided with an earthing wire attached to the power cord.

Type of Input Circuit

The input circuit of the instrument is not of the floating type but the circuit type applying the unbalanced signal against the earth potential. Never perform measuring the primary power source with an unclear earth potential, which causing significant danger.

Ensure to Replace a Fuse with the Requied Rated Current

0.3 A fuse is used in the instrument in order to prevent the damages to the circuit due to excessive voltage. If it is fused, make sure to replace only fuse with the required rated current after closely checking the cause of fusing and repairing the defective portion.

Never use those fuses other than the rated, as it may result in failure of the instrument.

TABLE OF CONTENTS

MEMO

Section 1 Specifications

1-1 GENERAL

The frequency counter SC-7101/SC-7102 are compact and light weight electronic measuring instrument which can measure frequency of wide range from 10 Hz to 200 MHz. Use of large and high luminousity LED in the display makes reading easier. This instrument is provided with following features.

Use of Easy-to-read Large Light Emitting Diode

The LED display is decimal 9 digits + 1 digit of exponent and employs Zero-blanking methode.

Capability of Measurement of Low Frequency Signals with High Resolution

This instrument allows measurement of signals of low frequencies with high resolution (normally 7-digits per 1 s) in a very limited time by the reciprocal methode frequency measurement.

Automatic change to direct frequency measurement for input signals of 10 MHz or more enables this instrument to perform measurement of input signals with the heightest resolution.

Provision of DIFF Calculation Function

This instrument can calculate and display differences between the values of input signals and the reference value by a simple operation.

Allows Easy Systemization of Measuring

Since mounting of an optional GP-IB interface or a centronix type parallel interface enables output of measured results, external reset, remote control of the time base, etc., this instrument can be built into a systemized configuration.

Built-in Highly Stabilized Reference Oscillator and Capability for External Connection

The SC-7101 and SC-7102 have built-in high stability reference oscillator of $\pm 3 \times 10^{-7}$/month and $\pm 2 \times 10^{-8}$/day respectively.

In addition, external input of reference signals of high accuracy is possible.

4-Step Setting of Sample Rate. (SC-7102)

Sample rates can be set in 4-steps of 200 msec x 1, x 2, x 4 and x 8.

Improved Shielding Effect

The specially treated cases provide better shielding effect than that of metal cases though these cases are made of light weight plastics.

Easy Mounting of Optional Supplies

Following optional supplies can be easily mounted. (For the SC-0108 and the SC-0110, select either one only. No mounting of both of them is permitted).

- Parallel interface SC-0108.
- GP-IB interface SC-0110.

On SC-7102, there are further additional options.

- High stability reference oscillator the SC-0114.
  (10 MHz $\pm 5 \times 10^{-9}$/day).
- High stability reference oscillator the SC-0115.
  (10 MHz $\pm 2 \times 10^{-9}$/day).

<Reference>

Out of the above options, when SC-0114 is mounted, on the Name plate on the rear panel showing the Model No., "B" is printed, while when SC-0115 is mounted, "C" is printed.

1-2 SPECIFICATION

1-2-1 Input Frequency Measurement

Measuring range
10 Hz to 200 MHz
1 kHz to 200 MHz with time base of 1 ms
100 Hz to 200 MHz with time base of 10 ms

Input voltage
At ATTEN 1 : 20 mVrms to 1 Vrms (1 kHz to 100 MHz)
50 mVrms to 1 Vrms (10 Hz to 200 MHz)
At ATTEN 1/20 : 0.4 Vrms to 20 Vrms (1 kHz to 100 MHz)
1 Vrms to 20 Vrms (10 Hz to 200 MHz)

Maximum input voltage
200 V (DC + peak AC)

Input RC
Approximately 1 MΩ//25 pF or less

Attenuator
1 or 1/20

Input coupling
AC

	SC-7101	SC-7102
Time base	10 ms, 0.1 s, 1 s, 10 s	1 ms, 10 ms, 0.1 s, 1 s, 10 s
Resolution		
10 MHz or more	100 Hz/10 ms, 10 Hz/0.1 s, 1 Hz/1 s, 0.1 Hz/10 s	1 kHz/1 ms, 100 Hz/10 ms, 10 Hz/0.1 s, 1 Hz/1 s, 0.1 Hz/10 s
10 MHz or less	5 digits/10 ms 6 digits/0.1 s 7 digits/ 1 s 8 digits/10 s	4 digits/1 ms 5 digits/10 ms 6 digits/0.1 s 7 digits/1 s 8 digits/10 s

Reading unit
EXPONENT (0, ±3, ±6, ±9) Hz

Error
10 MHz or more
Accuracy of reference oscillator ± 1 count
10 MHz or less
Accuracy of reference oscillator + $\frac{\text{Trigger error} \pm 1 \text{ reference time}}{\text{Measured frequency} \times \text{Time base}}$

1-2-2 General

Calculating function: DIFF;X-Xref X : Measured value, X-ref : Reference value

Display method: Storage display using the light emitting diode, zero blanking method

Display digits:
At mantissa : decimal 9 digits
DIFF Calculation : when the result is negative, - sign and decimal 8 digits
At exponent : 1 digit (0, ±3, ±6, ±9)

Display time: Time base + sample rate or infinite display

	SC-7101	SC-7102
Sample rate	Approximately 200 ms	Approximately 200 ms, 400 ms, 800 ms or 1.6 s
Reference oscillator		
Oscillation frequency	10 MHz	10 MHz
Aging rate	$\pm 3 \times 10^{-7}$/month, $\pm 10 \times 10^{-7}$/year (On the basis of 1 hour after power on)	$\pm 2 \times 10^{-8}$/day, $\pm 10 \times 10^{-8}$/year (On the basis of 24 hour after power on)
Rise time	$\pm 3 \times 10^{-6}$ (On the basis of 1 hour after power on, from immediately after power on)	$\pm 5 \times 10^{-8}$ (On the basis of 1 hour after power on, from 10 minutes after power on)
Temperature	$\pm 3 \times 10^{-6}$/0 °C to +40 °C	$\pm 5 \times 10^{-8}$/0 °C to +40 °C
Vibration	$\pm 1 \times 10^{-7}$ or less (For 30 minutes each in three direction at frequency of 10 Hz to 55 Hz and with amplitude of 1.5 mm)	$\pm 5 \times 10^{-8}$ or less (For 30 minutes each in three direction at frequency of 10 Hz to 55 Hz and with amplitude of 1.5 mm)
Impact	$\pm 1 \times 10^{-7}$ or less (Dropping from height of 50 mm above a hard wood three times each in three directions)	$\pm 5 \times 10^{-8}$ or less (Dropping from height of 50 mm above a hard wood three times each in three directions)

Output of reference frequency
- Frequency: 10 MHz
- Released voltage: 2 Vp-p or more
- 50 Ω terminal: 350 mVp-p or more

Input of reference frequency
- Frequency: 10 MHz
- Input voltage: 1 Vrms to 5 Vrms
- Maximum input voltage: 10 Vrms
- Input resistance: Approximately 10 kΩ
- Input coupling: AC

Power supply
- Supply voltage:

Center voltage	Voltage range
AC 100 V	90 to 110 V
AC 120 V	108 to 132 V
AC 220 V	198 to 242 V
AC 240 V	216 to 264 V

Selected with the voltage selector plug

Frequency range	50 Hz to 400 Hz
Power consumption	Approximately 11 W (SC-7101) Approximately 15 W (SC-7102)

1-2-3 Physical Characteristics

Weight	Approximately 2.5 kg
Dimension	(210±2)W x (100±2)H x (310±2)L [mm]

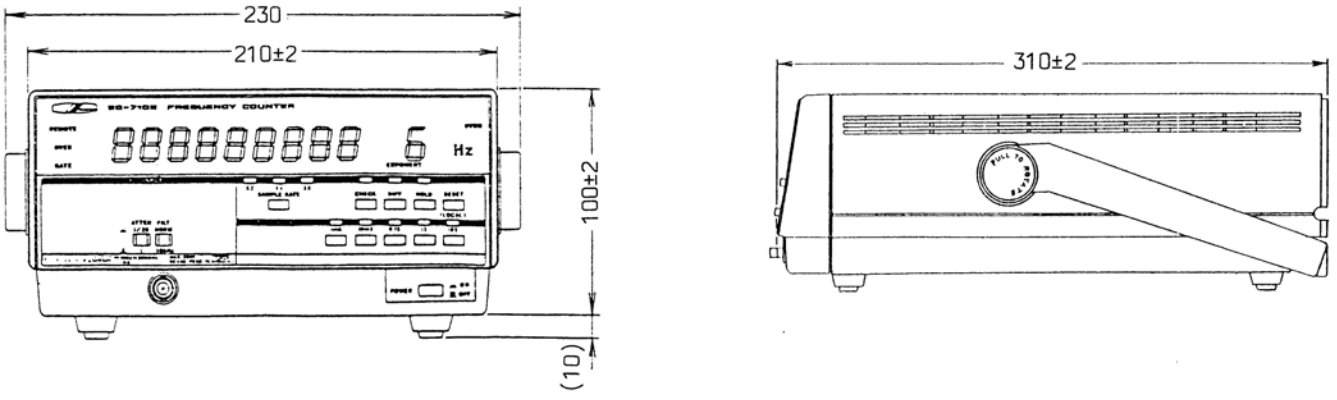
1-3 ENVIRONMENTAL CHARACTERISTICS

Operating temperature	0 °C to +40 °C
Operating humidity	85 %RH or less (0 °C to +40 °C)
Storage temperature	-20 °C to +70 °C
Storage humidity	90 %RH or less (0 °C to +70 °C)

1-4 ACCESSORIES

Power cord	1
Coaxial cable	1
Fuse (FSA-0.3A)	2
Accessory bag	1
Instruction manual	1

Figure 1-2-4. Dimension (SC-7102)



(SC-7101 and SC-7102 are of the same dimensions)

Section 2 Operating Information

CAUTION

- *Check mode and measurement mode*
  In this manual, the status, where LED located above the [CHECK] key is turned on, is called a "check" mode and the status, where such LED turns out, is called a "measurement" mode. With the "check" mode selected, performs self-check and displays the frequency (10MHz) of the internal reference oscillator.
  With the "measurement" mode selected, measures a signal applied to INPUT A or B.
- *Hold mode and sample mode*
  In this manual, the status, where LED located above the [HOLD] key is turned on, is called a "hold" mode, and the status, where such LED is turned out, is called a "sample" mode.
  With the "hold" mode selected, measurement is stopped, while such measurement already started before the [HOLD] key is pressed, is continued until completion.
  With the "sample" mode selected, the SC-7101 repeats measuring at the rate of approximately 200 ms and the SC-7102, at the preset sample rate.

2-1 FRONT PANEL

This paragraph describes the switches and keys on the front panel and the display which indicates measured results.
See to Figure 2-1-1-(1)•(2)

2-1-1 Power Supply

① POWER ON-OFF
Selects line voltage on or off.

2-1-2 Display of Measured Results

② Numerical display LED
Indicates the measured results in 9 digits of the mantissa (or 8 digits with a negative sign) and one digit of the exponent with - sign.

③ STATUS LED
Indicates operating status, which are REMOTE, OVER, GATE and OVEN (for SC-7102) statuses.
REMOTE : Turns on in only GP-IB remote status.
OVER : Turns on when the measured results causes overflow.
GATE : Turns on at the measuring gate open.
OVEN : Indicates to use a high stability crystal oscillator with thermostat (for SC-7102 only).

2-1-3 Input

④ BNC connector
Signal input connector to measure frequency from 10 Hz to 200 MHz. Input Voltage is 200 V (DC + AC peak).

⑤ FILT NORM-10 kHz
Selects the low pass filter of 10 kHz on or off. In such a case where noises of high frequencies are contained in low frequency signals, attenuate frequency higher than 10 kHz.

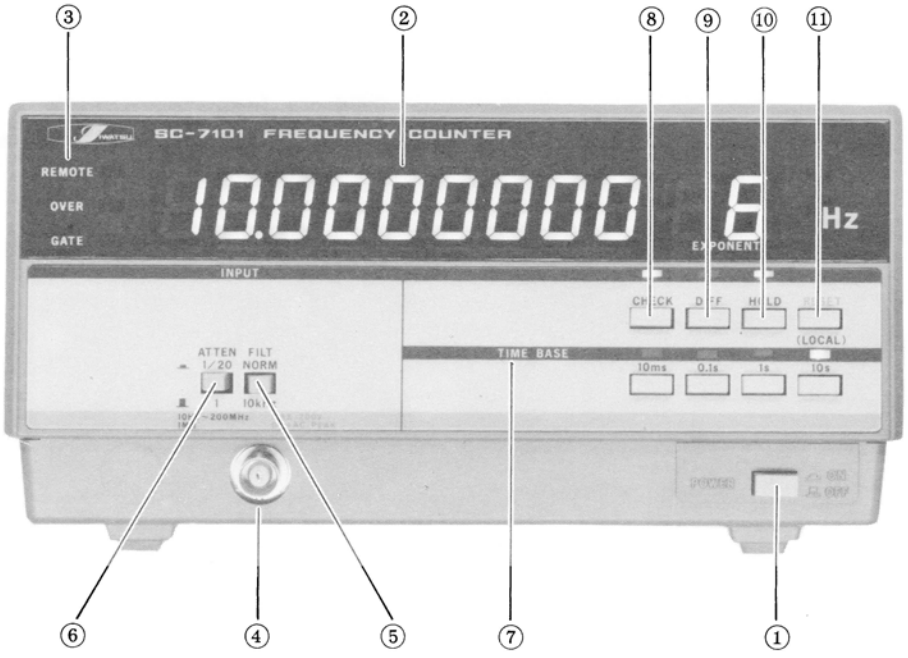
⑥ ATTEN 1/20-1
Selects attenuator of 1/1 or 1/20.
X1 position connects input signal directly to input amplifiers, X20 position attenuates input signal by a factor of 20 (nominal).

2-1-4 Measuring Condition Setting

⑦ TIME BASE
Selects a TIME BASE.
The TIME BASE are displayed by 1 ms (for SC-7102 only), 10 ms, 0.1 s, 1 s and 10 s (in black color) which locate above the keys.
Mounting of the GP-IB interface (optional supply) allows the external remote control.

⑧ CHECK
Selects the "check" mode or "measure" mode.
When the LED located above the [CHECK] key turns on, the "check" mode is selected and the instrument performs self-checks with frequency (10 MHz) of the internal reference oscillator.
When the LED located above the [CHECK] key turns out the "measure" mode is selected and the instrument measures input signals applied to BNC connector of INPUT.

Figure 2-1-1-(1). Front Panel (SC-7101)



⑨ DIFF

Performs DIFF calculation (X-Xref) while LED located above the DIFF key turns on, indicates that the instrument is put in DIFF calculating status, while this LED turns out, the DIFF calculation is released.

To perform calculation, set in DIFF calculation status and then register the reference value (Xref) with the RESET key. For further details, refer to "3-3-2 DIFF Calculation".

⑩ HOLD

Selects the hold or sample mode.

While lighting of LED located above the HOLD key, the instrument is put in the hold status to stop measurement and keep displaying the results measured before pressing the HOLD key. However, such measurement, which has already started before the HOLD key is pressed, is performed until completion.

While this LED turns out, the instrument is put in the sample status to repeat measurement in accordance with the preset sample rate (SC-7101 is fixed at 200ms).

⑪ RESET (LOCAL)

Performs the following operation by pressing the RESET key.

- Interrupts all process being executed when the RESET key is pressed.
- Clears the display of the measured results.
- Updates measuring.
- If DIFF calculation is selected, resisters internally the restarted measuring results as Xref by pressing the RESET key.
- In the GP-IB mode, it is recognized as a LOCAL key.

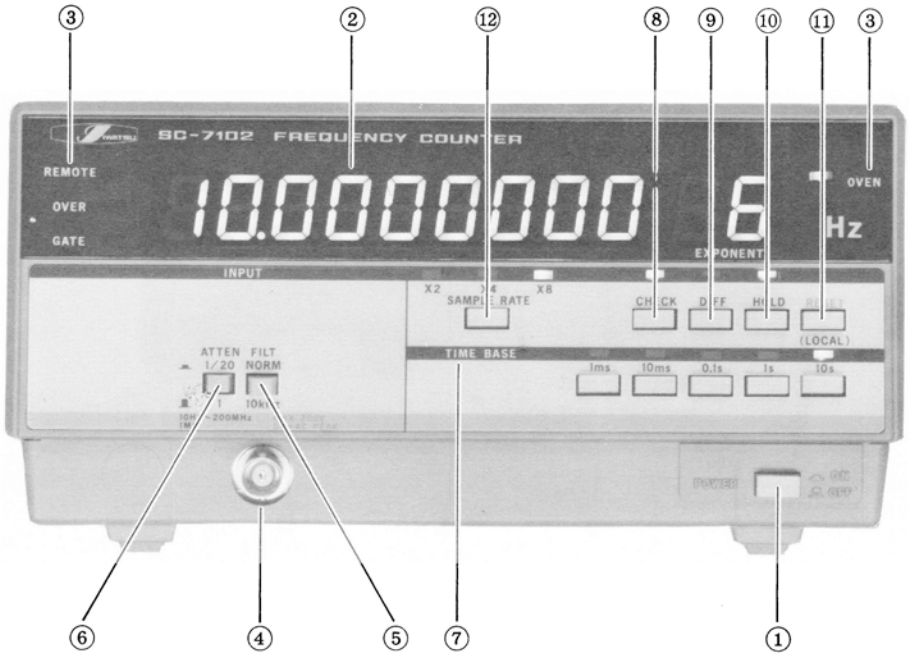
⑫ SAMPLE RATE x2, x4, x8 (SC-7102 only)

Selects SAMPLE RATE time.

Each pressing the SAMPLE RATE key allows selection of sample rates in the following sequence.

All LED turns out	LED turns on	LED turns on	LED turns on
x 1 →	x2 →	x4 →	x8 →
Approximately 200 ms	Approximately 400 ms	Approximately 800 ms	Approximately 1.6 s

Figure 2-1-1-(2). Front Panel (SC-7102)



2-2 REAR PANEL

Describes switch and connectors on the rear panel.

Refer to Figure 2-2-1.

⑬ 10 MHz STD IN-OUT BNC connector

Either provides 10 MHz of the internal reference oscillator or apply external signals of the reference frequency of high accuracy.

OUT:

Provides from the 10 MHz STD connector immediately when 10 MHz internal reference oscillator is internally connected.

IN:

Disconnects internal connection of 10 MHz internal reference oscillator. In this case, applies 10 MHz of an external reference oscillator to the 10 MHz STD connector.

⑭ FUSE, VOLTAGE SELECTOR

Both the fuse holder and the power supply voltage selector. To select the power supply voltage, remove the fuse holder cap and then select it.

⑯ AC LINE INPUT

Connect the power cord to it.

⑳ ⏚ (GND)

Protective grounding terminal.

⑰ DATA OUT connector installed location (option)

Installs the data output connector for the parallel interface SC-0108.

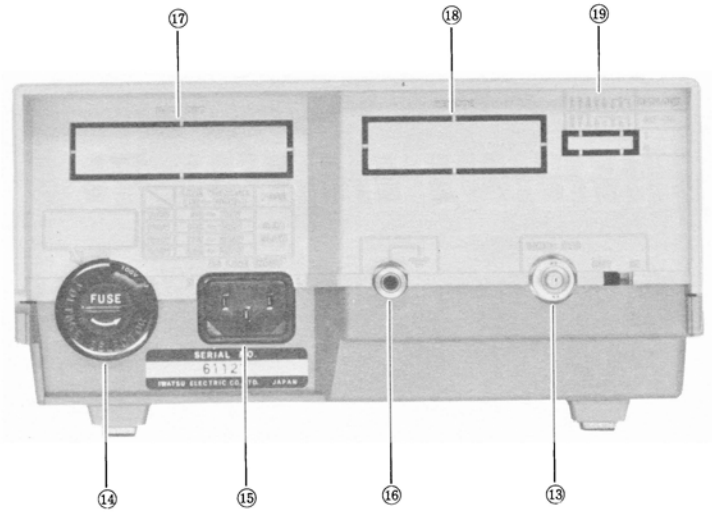
⑱ REMOTE connector installed location (option)

Installs the input/output connector for the GP-IB interface SC-0110.

⑲ Switch installed location (option)

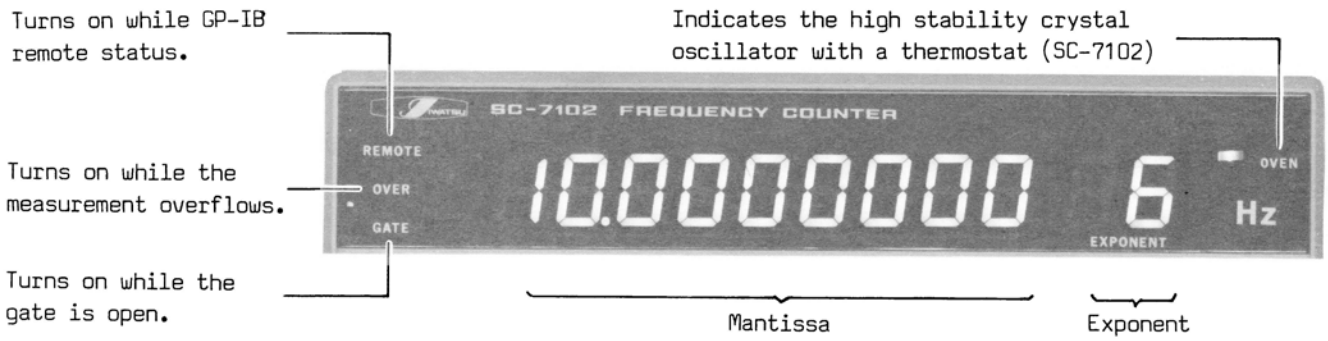
Installs the switch for the parallel interface SC-0108 or the GP-IB interface SC-0110.

Figure 2-2-1. Rear Panel



2-3 DISPLAY UNIT

11 digits LED to shows measured results of input signals.



Display of Hysteresis in a Mantissa

In measurement of the signal of 10 MHz or less, resolution is determined according to the measurement time. Thus, if MSD value of the measured results changes from 9 to 10 or vice versa, read-out of the results becomes difficult, since the position of decimal point and exponent change while the number of digit displayed remains same.

To solve this problem, when MSD value changes from 9 to 10, the display of the mantissa is shifted to left by 1 digit to blank the lowest digit. (For the external output data, 0 is added to the lowest digit).

When MSD value changes from 10 to 9, the display of the mantissa is shifted to right by omitting 1 digit.

Through the above operations, hysteresis is provided with display for easy read-out. If this operations are performed 8 times continuoutly or if the MSD value becomes any one of 2 through 8, results will be displayed without such operations.

In the RECIPROCAL mode measurement, where the result is obtained by calculating the count data, there may be 1 digit difference in the effective digit due to calculated error even in measurement in the same range. Also, in such a case, the same processes as above are performed to ensure easy read-out.

On Displays

- The highest 9 digits indicate the mantissa. However, in the case when the measured result is negative, the first digit (the left-end of the mantissa display) takes "-" sign and the display of the measured result is maximum 8 digits.
- The lowest two digits (10th and 11th digits from the left) display the sign of the exponent and 1 digit of the exponent.
- The displays of the exponent are by such multiples of 3, as, -9, -6, -3, 0, 3, 6, 9. When the sign of the exponent is +, this position is left blank.
- For display of the mantissa, the leading zero blanking occurs.
- When the measurement overflows, normally the OVER LED and the date display indicates overflow mark "␣␣␣...". However, though counting has been 10 or more digits, the data display shows the mantissa in 9 digits from the lowest digits and indicates the overflow by turning on the OVER LED.

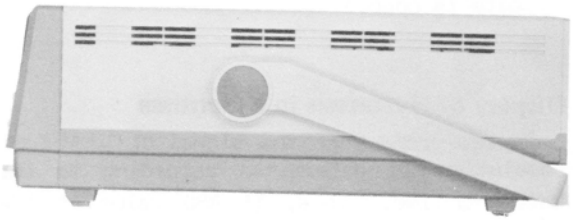
2-4 HOW TO USE THE CARRYING HANDLE (STAND)

The lock of the carrying handle is released by pulling both ends of it outward, allows turning of the handle approximately every 20 degree. When fixed at the bottom of the instrument, the handle serves as the stand.

When this carrying handle is not used as the stand or the instrument is stored, turn the handle to the instrument rear side, via the bottom and store the handle as shown in Figure 2-4-2.

Figure 2-4-1. How to Use the Carrying Handle

Figure 2-4-2. Storing of the Carrying Handle



Section 3 Measuring Procedures

3-1 POWER-ON

When the POWER switch is turned on, display tests of LEDs are performed in the following sequence.

1. All LEDs turn on and off three times in succession except GATE and OVEN (for SC-7102) LEDs.
2. Mumeral display LEDs display each number from 0 to 9 in this order once for each number, except the LED which indicates - sign of the exponent.
3. Set the keys as follows:
   - TIME BASE key 1 s (LED turns on)
   - CHECK key CHECK MODE (LED turns on)
4. The data display indicates the frequency of the internal reference oscillator as: "10,000,000 6Hz" (Refer to Figure 3-1-1.)

Mounting of the parallel interface, the SC-0108 (optional supply) enables any selection of initial values of TIME BASE and CHECK ON-OFF.

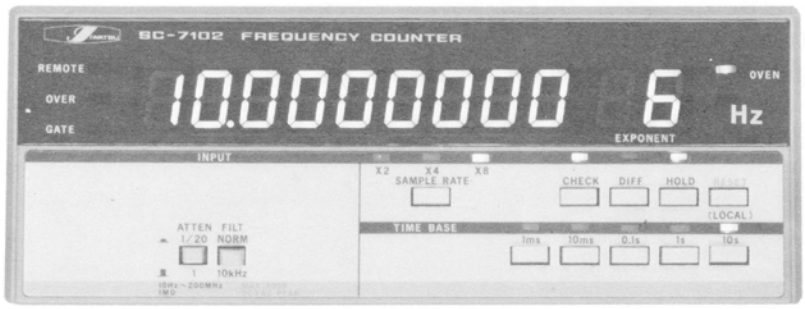
Any selection of INPUT SELECT initial value is also possible.

3-2 ON RESET

Performs following operations by pressing of the [RESET] key.

- Interrupts all process being executed when the [RESET] key is pressed.
- Clears the display of the measured results.
- Updates measuring.
- If DIFF calculation is selected, resistors internally the restarted measuring results as Xref by pressing the [RESET] key.
- In the GP-IB mode, it is recognized as a [LOCAL] key.

Figure 3-1-1. The Display of Initial Setting



3-3 MEASUREMENT

3-3-1 Frequency Measurement

Internal Self-check

With turning on the power switch, after performing "power on self-check", measuring the 10 MHz of the internal reference oscillator with TIME BASE 1 s, displays "10.000 000 6 Hz".

Then, the display is changed by TIME BASE as listed in Table 3-3-1.

Table 3-3-1.

TIME BASE	Count display		Display unit
	Mantissa	Exponent	
1 ms	10.000	6	Hz
10 ms	10.0000	6	Hz
0.1 s	10.00000	6	Hz
1 s	10.000000	6	Hz
10 s	10.0000000	6	Hz

<Note>

1 ms of TIME BASE, available for the SC-7102 only.

Measurement Procedure

- Press the [CHECK] key and set to the "MEASURE" mode. (LED turns out).
- Operate ATTEN and FILT switches.
- Connect the signals to be measured to the input connector.
- Connect the signals to be measured to the input connector selected with the INPUT SELECT key.
- Select the most suitable TIME BASE.
- In case of holding the measured results, press the [HOLD] key. Then the LED located above the key turns on and holds the results.

Reference for Frequency Measurement

When the signals to be measured are higher than 10 MHz; The measuring gate opens for the time selected as the TIME BASE, and counts and displays frequencies of input signals during this period.

When signals to be measured are lower than 10 MHz; Measure by the RECIPROCAL method.

REFERENCE

RECIPROCAL Method

The reference gate opens for the time selected as the TIME BASE, then the measuring gate opens in triggering the input signals. After closing of the reference gate, the measuring gate closes triggering with the input signals. The instrument, counting the measuring gate open term "t" with the reference clock (10 MHz) also counts a number of period "n" of the signals to be measured within this term and obtains the frequency by executing calculation of f = n/t and displays the result. (reciprocal of the average period measurement).

When this method is used, irrespective of the input frequency, resolution of the results is determined by the measuring time (displays 7 digits for 1s gate, normally).

Errors in Measurement

Errors in frequency measurements, there are "errors due to accuracy of the reference oscillator", "± 1 count error" and the "Trigger error".

"Error due to accuracy of the reference oscillator":

Since the counting time (gate time) of the frequency measurement are determined by dividing the oscillation frequency of the reference oscillator (crystal oscillator), this error depends on the accuracy of the reference oscillator.

"Error of ± 1 count":

Although the digital measuring instrument is a measuring instrument of high accuracy, on instruments which count by opening and closing of gates, a quantization error of ± 1 count occurs.

"Trigger Error":

Normally the measuring error due to the trigger error is proportional to the noise level. This error is larger when the slope of the area setting the trigger level of the input signal waveform is less sharper.

This error is the minimum when the trigger level of a sine waveform, as shown in Figure 3-3-1, is set in the center level of the waveform. Relation of the input signal voltage, noise voltage and the error can be expressed by the following equation.

$$\frac{2\Delta T}{T} = \frac{1}{\pi} \times \frac{En}{Es} \quad (\because \frac{En}{\Delta T} = \frac{2\pi Es}{T})$$

As it is clear from this equation, in case of the sinewave, this error is solely determined by the ratio of noiseless signal Es and noise En, irrespective of the frequency. For example, the error when S/N is 40 dB, comes to 0.3 % when 60 dB, 0.03 % from the above equation.

When average values of input signals during N period are measured:

$$\frac{2\Delta T}{NT} = \frac{1}{\pi} \times \frac{En}{Es} \times \frac{1}{N}$$

Showing 1/N reduction in error. Consequently, measurements of average values of various periods are advantageous as they can reduce influence of noise.

How do these errors appear in the actual measurement. Figure 3-3-2 and 3-3-3 shows relation between input signal and error frequency after calibration of the reference oscillator and errors.

Figure 3-3-1. Trigger Error

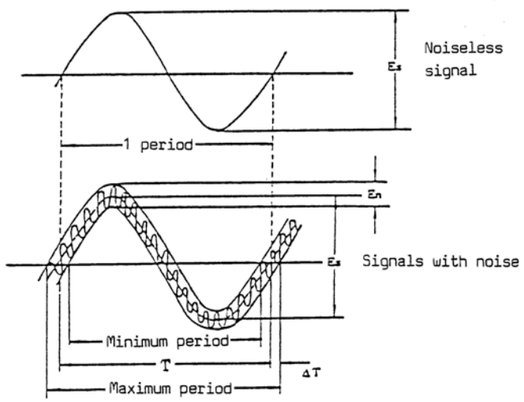


Figure 3-3-2. Frequency and Error in Frequency Measurement I (Sinewave; when S/N is 40 dB) (SC-7101)

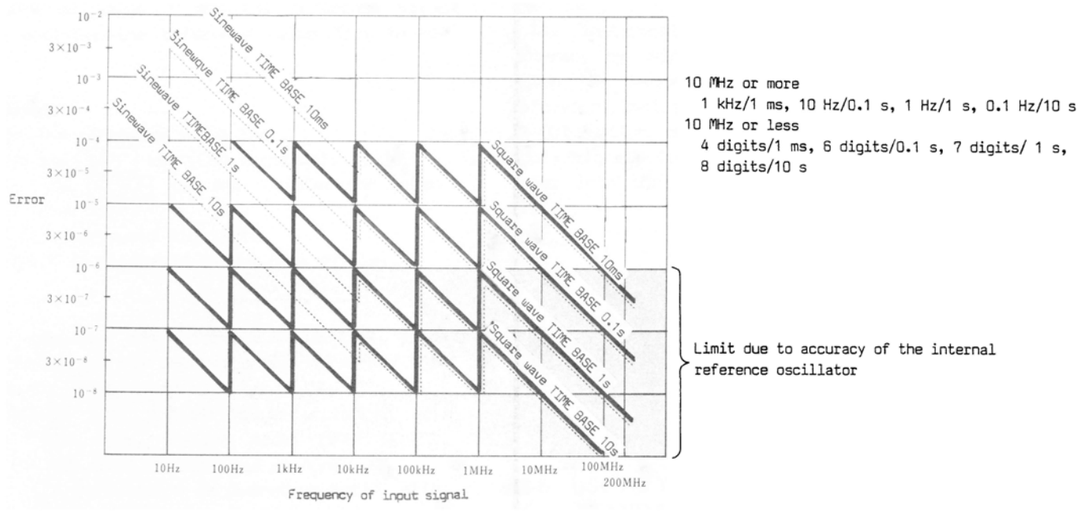
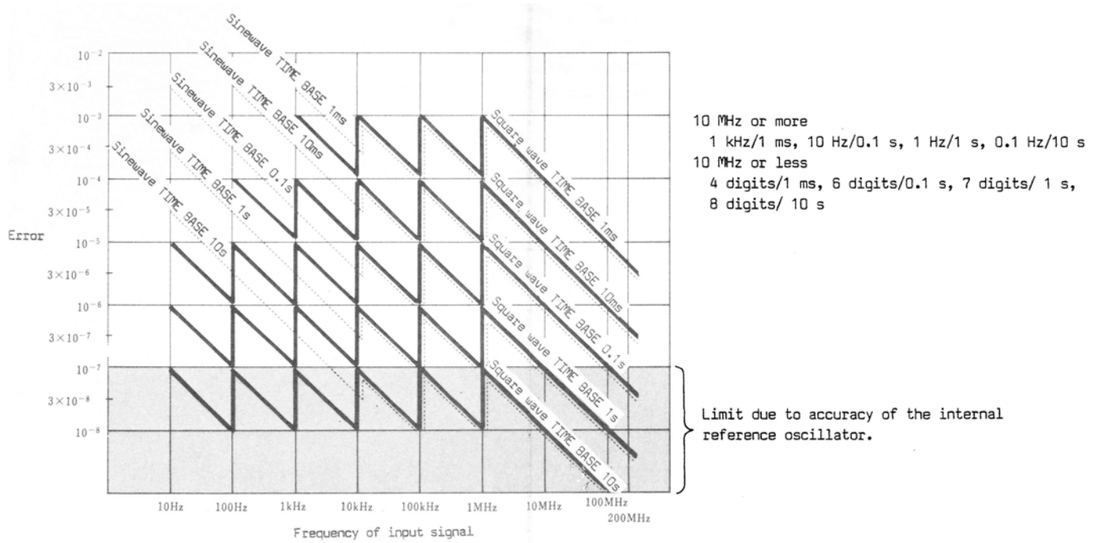


Figure 3-3-3. Frequency and Error in frequency Measurement II (Sinewave; when S/N is 40 dB) (SC-7102)



3-3-2 DIFF Calculation

Performs calculation of difference between the measured value X and the reference value Xref. Register the reference value Xref in advance.

Measurement

1. Apply the reference value Xref.
2. Press the [DIFF] key (LED turns on).
3. Press the [RESET] key and register the reference value Xref.
4. Apply the measured signal X.
5. "X-Xref" is displayed on the data display.

<Note>

- To re-register the reference value Xref, apply the signal of the new reference value and then press the [RESET] key.
- Registered Xref values remain unchanged even when CHECK mode, MEASURE mode, INPUT SELECT, SAMPLE RATE and TIME BASE are changed.
- When DIFF calculation is turned on again, after once turned off, the Xref which has been previously registered, remains unerased. (When using the same value as the Xref, no new registration is required).
- Turning on line voltage, clears Xref, resetting to 0.

3-4 MEASUREMENT USING AN EXTERNAL REFERENCE OSCILLATOR

The instrument allows measurement of higher accuracy by using external reference oscillator which has higher accuracy than the internal reference oscillator. In this case, set the IN-OUT switch on the rear panel to "IN" and apply signals from the external reference oscillator into the input-output connector of 10 MHz STD.

CAUTION

Make sure to set the IN-OUT switch to "OUT" except when applying signals of the external reference oscillator.

3-5 USE AS THE SECONDARY FREQUENCY STANDARD

When the In-Out switch on the rear panel is set to "OUT", the input-output connector of the 10 MHz STD provides signals of the 10 MHz reference oscillator.

This signal, because of its very high accuracy, can be used as the external driving signal of pulse generators or time markers for adjusting the oscilloscope.

Section 4 Adjustment of Reference Oscillator

Though the SC-7101 and the SC-7102 counters use a high accuracy crystal oscillator, when continuous measurement of high accuracy are required, adjust the crystal oscillator.

4-1 PREPARATION FOR ADJUSTMENT

Perform adjustment of the reference oscillator by removing the upper case.

4-1-1 Removing the Upper Cover

Remove the upper cover by the following procedures.

1. Face the instrument bottom up and remove 3 screws on the bottom. (See to Figure 4-1-1).
2. Hold the bottom and upper covers between both hands securely and place with the bottom down.
3. Lift the upper cover rear end slightly up and remove the upper case by pulling it backward. (The upper cover front end is inserted into the panel frame).
   (See Figure 4-1-2).

<Note>
To install the upper cover, reverse the above procedures to remove the upper cover.

4-1-2 External Reference Oscillator

Accuracy of the reference oscillator is as follows:

SC-7101
10 MHz reference signal of $\pm 1 \times 10^{-7}$.
SC-7102
10 MHz reference signal of $\pm 1 \times 10^{-8}$.

Figure 4-1-1. Screw Location on Bottom

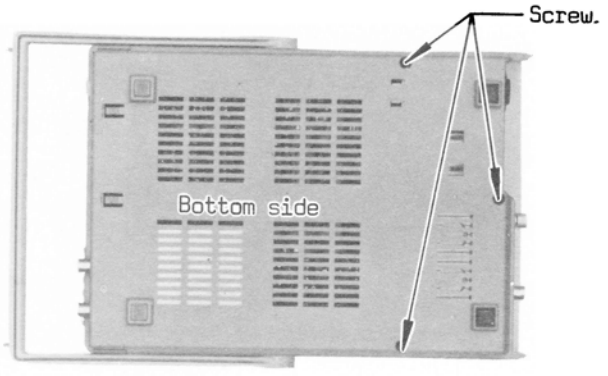
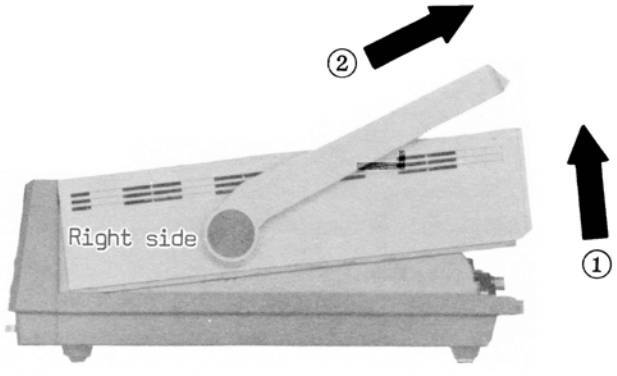


Figure 4-1-2. Removing the Upper Cover



4-2 ADJUSTMENT PROCEDURE

CAUTION

- *Set the ambient temperature to +23°C ± 5°C and humidity to 85 %RH or less.*
- *Perform minimum 1 hour warm-up for sufficiently stabilized operation of the reference oscillator of the instrument.*
- *Never touch except where absolutely necessary for adjustment. Unnecessary touching may result in the failure of the instrument or an electric shock of a operator.*

Item	Contents	Counter model	
		SC-7101	SC-7102
Rating	Aging rate	±3 x 10^{-7}/month ±10 x 10^{-7}/year On the basis of 1 hour after power on	±2 x 10^{-8}/day ±10 x 10^{-8}/year On the basis of 24 hours after power on
	Temperature variation	±3 x 10^{-6}/0 °C to +40 °C	±5 x 10^{-8}/0 °C to +40 °C
Setting	CHECK ATTEN FILT TIME BASE	"MEASURE" mode (when the LED located above the [CHECK] key turns out) 1 NORM 1 s	10 s
Connection	–	Apply the signal of reference oscillator (accuracy ±1 x 10^{-7}) to the INPUT B.	Apply the signal of reference oscillator (accuracy ±1 x 10^{-8}) to the INPUT B.
Display	–	Within 10.000 000 6 ± 2 counts) (±2 x 10^{-7})	Within 10.000 000 0 6 ± 2 counts) (±2 x 10^{-8})

Figure 4-2-1. Adjustment Location I (SC-7101)

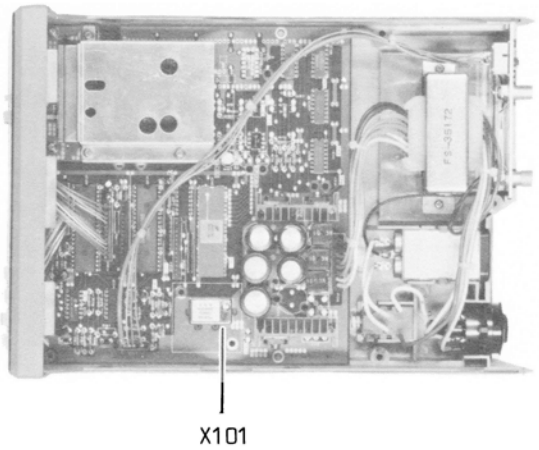
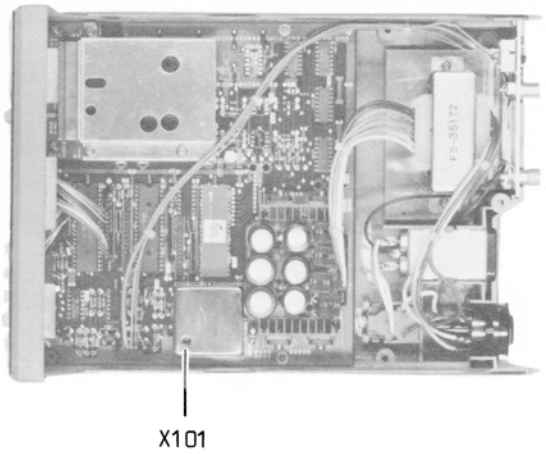
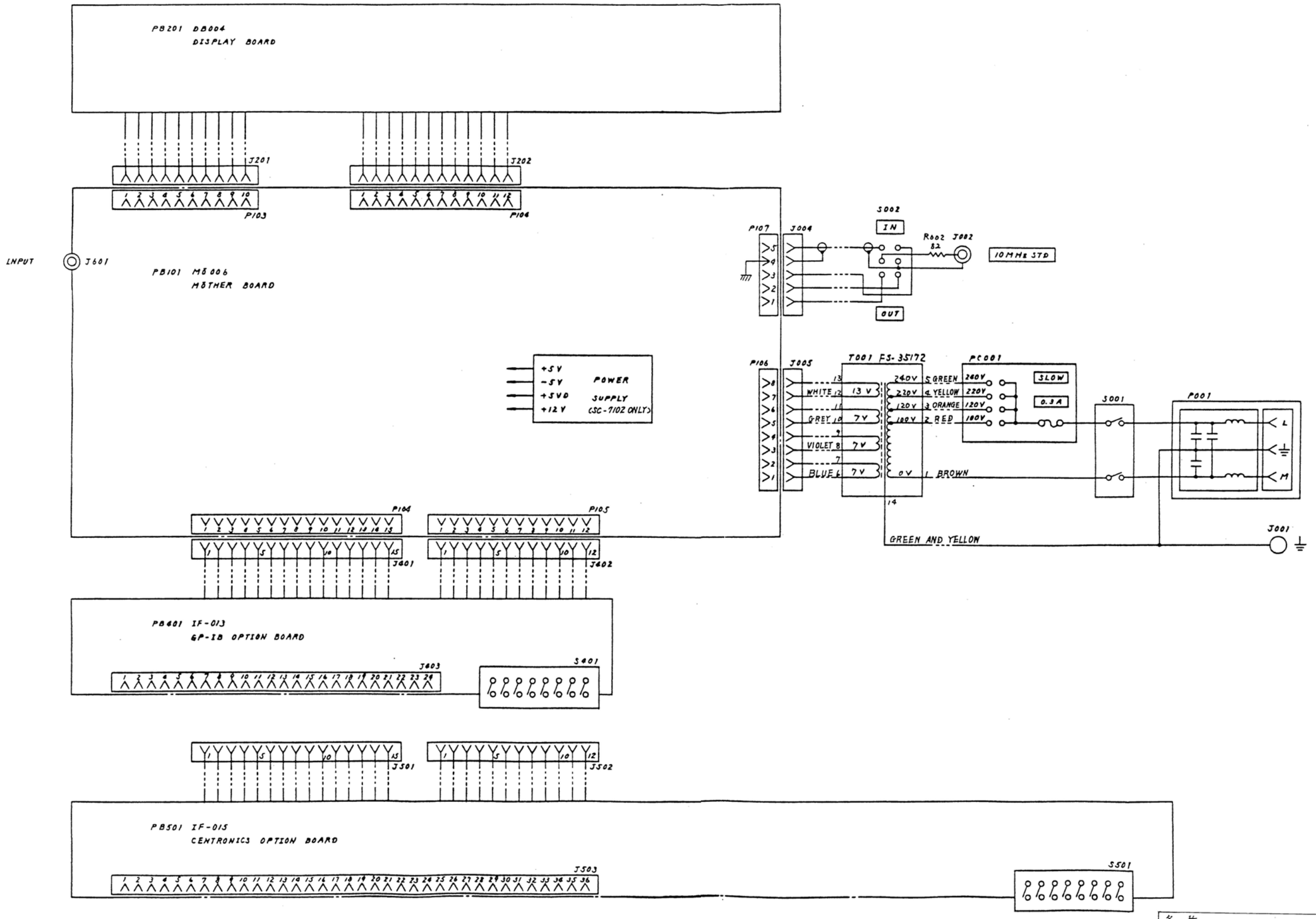


Figure 4-2-2. Adjustment Location II (SC-7102)

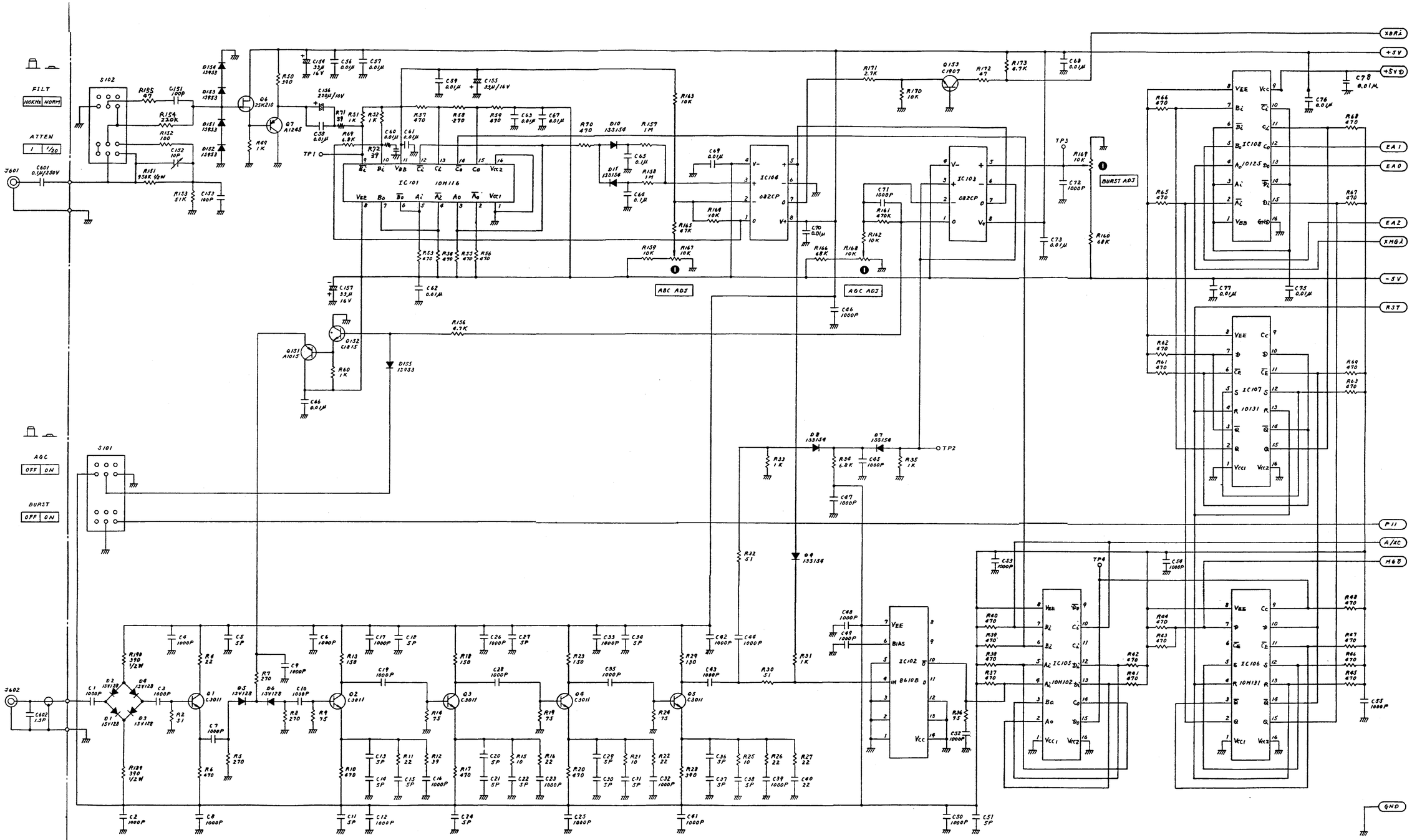


MEMO

Section 5 Schematic Diagrams



名称	SC-7101 / SC-7102 OVER ALL
図番	BBZSC71020109



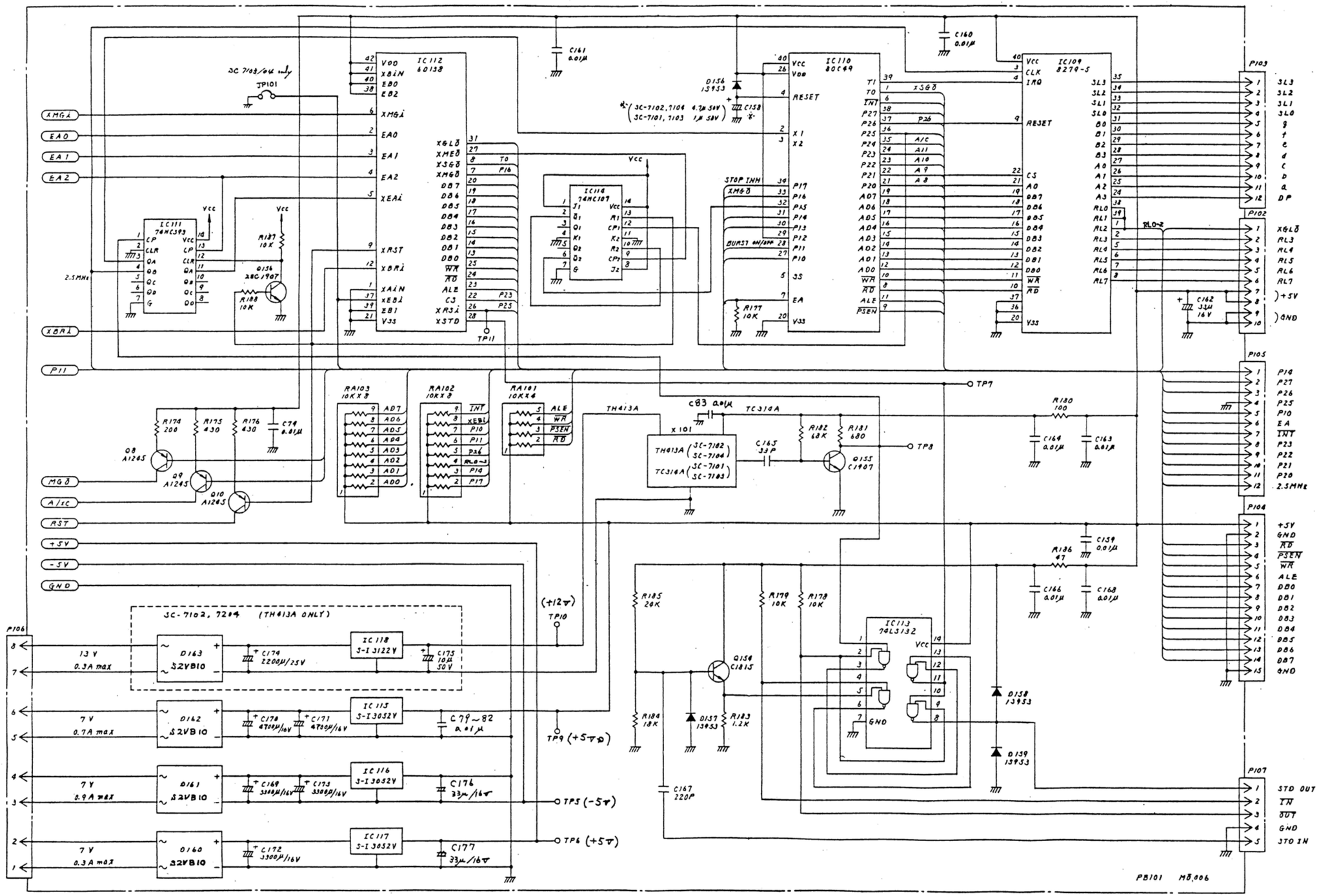
SC-7103, 7104

CHIP PARTS	C151 ~ 157
C1 ~ 83	D151 ~ 155
R2, 4 ~ 92	IC101 ~ 108
D1 ~ 11	Q151 ~ 153
Q1 ~ 7	R151 ~ 173, 189, 190
	S101, 102
	J601, 602
	C601, 602

SC-7101, 7102

CHIP PARTS	C151 ~ 157
C56 ~ 77	D151 ~ 156
R37 ~ 39, 61 ~ 70	IC101, 106 ~ 108
D6, 7	R151 ~ 155, 157 ~ 159, 163 ~ 165, 167
Q10, 11	S102
	J601
	C601

名称	SC-7101~7104 MOTHER BOARD M0006 (1/2)
図番	EBWSC14009106
	1

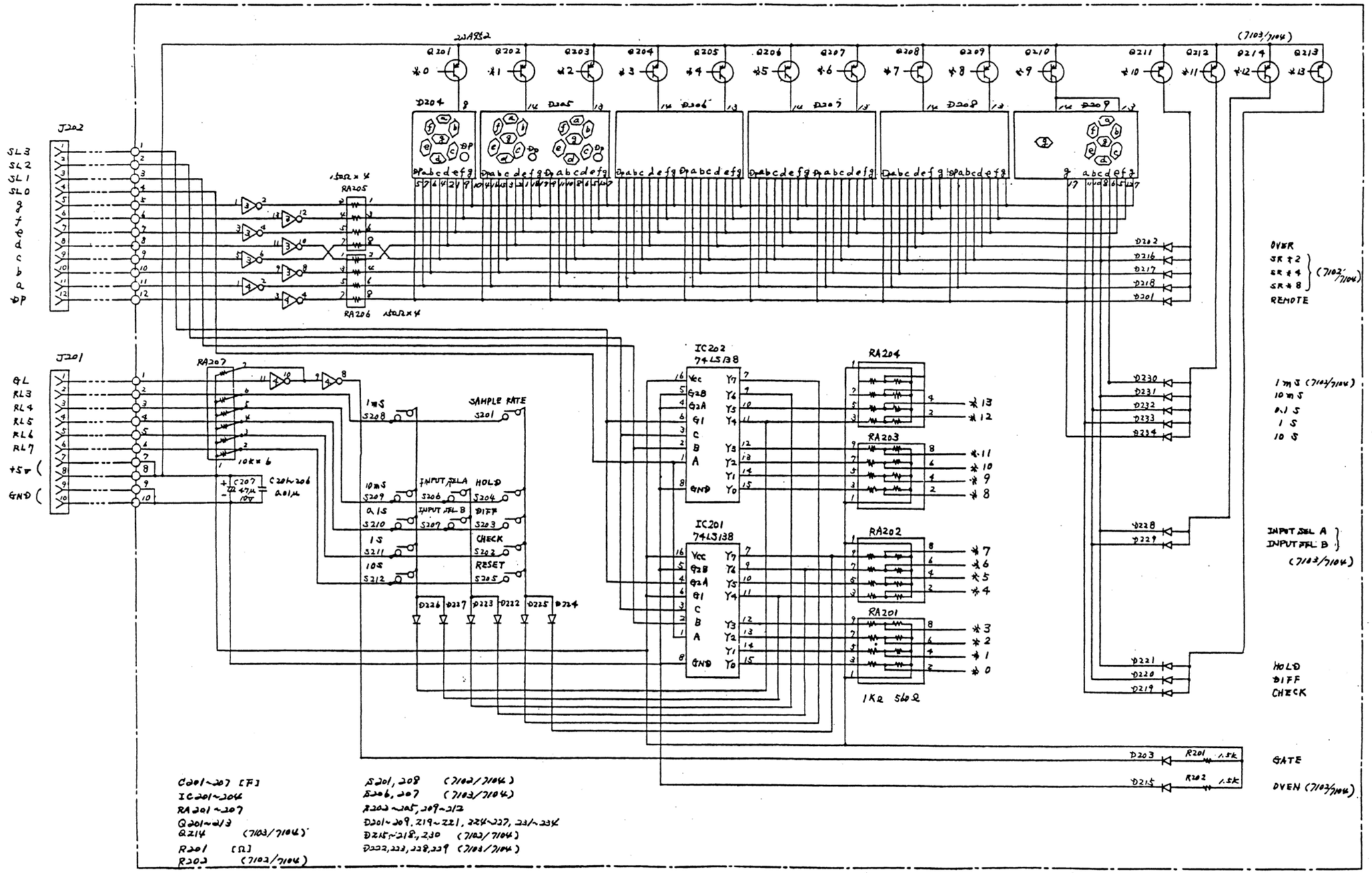


C158 ~ 175
D156 ~ 163
IC109 ~ 118
Q154, 155.
R174 ~ 186
RA101 ~ 103
P102 ~ 107, 111 ~ 113
X101

CHIP PARTS
C74
Q8 ~ 10

Missing numbers in the SC-7101 and SC-7103 are as follows:
C174, C175, D163, IC118 and JP101

名称	SC-7101~7104 MOTHER BOARD M0006 (2/2)
図番	BBWSC14009105 | 1



C201~207 [F]
IC201~206
RA201~207
Q201~213
Q214 (7103/7104)
R201 [Ω]
R203 (7103/7104)

S201, 208 (7102/7104)
S206, 207 (7103/7104)
R202~205, 209~212
D201~209, 219~221, 224~227, 231~234
D215~218, 230 (7103/7104)
D222, 223, 228, 229 (7102/7104)

D216~221 228~234	BR5511K-1
D201~203, 215	BR5531K
D204	NAR161B
D205~209	NAR261B
D222~227	1SR53

名称	SC-7101~7104 DISPLAY BOARD DB004
図番	BBWSC41010105
	1

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